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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/686,943	10/12/2000	Howard E. Rhodes	M4065.0112/P112-A	5424

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EXAMINER	
NGUYEN, KHIEM D	
ART UNIT	**PAPER NUMBER**
2823	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/686,943	Applicant(s) RHODES, HOWARD E.	
	Examiner Khiem D Nguyen	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 60-99 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 60-99 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 12 October 2000 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 60-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548), Osawa et al. (U.S. Patent 6,071,443) and Fossum (U.S. Patent 5,887,049).

Fan teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and FIGS. 1-2):

providing a substrate 10 having an photoactive regions (12a, 12b, 12c, 12d) formed thereon and a passivation layer 16 over the photodiode regions;

forming a patterned photoresist layer on at least a portion of the passivation layer;

forming patterned mircolens layers (24a, 24b, 24c, 24d) from said patterned photoresist layer wherein a spacer layer 22 having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) is formed under the microlens layers; and

forming an encapsulant layer on said microlens layers.

Fan teaches that the photosensitive and photoactive regions may employ photoactive elements such as but not limited to photodiodes and photocapacitors. It would have been obvious that the photoactive regions are the pixel sensor cells.

Fan teaches that the encapsulant layer can be formed of inorganic or organic encapsulant materials by chemical vapor deposition (CVD) or by a low temperature plasma enhanced chemical deposition step. It would have been obvious that the inorganic and organic encapsulant materials are the insulating materials. Therefore, the encapsulant layer is a insulation layer.

Fan fails to teach forming the lens forming layer by a spin-coating process wherein the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, thermoset resin, photosensitive gelatin, and radiation curable resin and wherein the optical thermoplastic is selected from the group consisting of polymethylmethacrylate, polycarbonate, polyolefin, cellulose acetate butyrate, and polystyrene as recited in present claims 63-65.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin wherein the thermoplastic is selected from polystyrene. See col. 9, lines 15-34. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration. See col. 9, lines 40-41.

Fan fails to teach that the radiation curable resin is selected from the group consisting of acrylate, methacrylate, urethane acrylate, epoxy acrylate, and polyester acrylate as recited in present claim 66.

Osawa teaches forming a lens sheet using radiation curable resin selected from urethane acrylate. See col. 6, lines 41-53. ***It would have been obvious to one of ordinary***

skill in the art of making semiconductor to incorporate Osawa teaching into Fan's method because in doing so a lens sheet having no damage on the lens area can be obtained. See col. 6, lines 41-53.

Fan fails to teach that the substrate further comprises a CMOS pixel array of a CCD pixel array formed thereon as recited in present claims 61-62.

Fossum teaches a substrate 101 comprises a CMOS pixel array 104 or a CCD pixel arrays formed thereon. See col. 3, lines 3-17 and FIG 1. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Fossum teaching into Fan's method because doing so can speed up the processing speed and save memory space. See col. 4, lines 54-56.

Fan teaches that the passivation layer is formed of a passivation material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride but fails to teach that the insulation layer is a layer of material selected form the group consisting of silicon oxide, silicon nitride, and silicon oxynitride as recited in present claim 67.

However, ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to form the insulation layer using material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

Fan fails to teach that the low temperature is a temperature within the range of approximately 200 to 400 degrees Celsius as recited in present claim 70.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the low temperature through routine experimentation and optimization to obtain optimal or

desired device performance because the low temperature is result-effective variables and there is no evidence indicating that the low temperature is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

3. Claims 73-86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548) and Osawa et al. (U.S. Patent 6,071,443).

Fan teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and FIGS. 1-2):

forming a patterned photoresist layer on an imaging device;

treating said patterned photoresist layer by thermally reflowed at a temperature within the range of approximately 144 to 176 degrees Celsius to form a plurality of microlenses (24a, 24b, 24c, 24d) wherein a spacer layer 22 having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) is formed under the microlens layers before formation of said patterned photoresist layer; and

forming an encapsulant layer on each microlens layers by photochemically cured employing radiation.

Fan teaches that the encapsulant layer can be formed of inorganic or organic encapsulant materials by chemical vapor deposition (CVD) or by a low temperature plasma enhanced chemical deposition step. It would have been obvious that the inorganic

and organic encapsulant materials are the insulating materials. Therefore, the encapsulant layer is a radiation transparent insulation layer.

Fan fails to teach that the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, thermoset resin, photosensitive gelatin, and radiation curable resin and wherein the optical thermoplastic is selected from the group consisting of polymethylmethacrylate, polycarbonate, polyolefin, cellulose acetate butyrate, and polystyrene as recited in present claims 74-75.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin wherein the thermoplastic is selected from polystyrene. See col. 9, lines 15-34. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration. See col. 9, lines 40-41.

Fan fails to teach that the radiation curable resin is selected from the group consisting of acrylate, methacrylate, urethane acrylate, epoxy acrylate, and polyester acrylate as recited in present claim 76.

Osawa teaches forming a lens sheet using radiation curable resin selected from urethane acrylate. See col. 6, lines 41-53. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Osawa teaching into Fan's method because in doing so a lens sheet having no damage on the lens area can be obtained. See col. 6, lines 41-53.

Fan teaches that the passivation layer is formed of a passivation material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride but fails to teach that the insulation layer is a layer of material selected form the group consisting of silicon oxide, silicon nitride, and silicon oxynitride as recited in present claims 80-82.

However, ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to form the insulation layer using material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

Fan teaches forming the encapsulant layer comprises a radiation exposure step but fails to teach that treating the lens forming layer to form a plurality of microlenses comprises a radiation exposure step as recited in present claim 79.

However, ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to include a radiation exposure step in forming a plurality of microlenses.

Fan fails to teach wherein said insulation layer forming step comprises a plasma deposition step carried out at a temperature within the range of approximately 200 to 400 degrees Celsius as recited in present claim 84.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the temperature of the plasmas deposition step through routine experimentation and optimization to obtain optimal or desired device performance because the temperature of the plasmas deposition step is result-effective variables and there is no evidence indicating that the temperature of the plasmas deposition step is critical and it has been

held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

4. Claims 87-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548) and Fossum (U.S. Patent 5,887,049).

Fan teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and FIGS. 1-2):

forming a patterned photoresist layer on an imaging device;

patterning said patterned photoresist layer to form a plurality of lens forming regions;

treating said lens forming regions by thermally reflowed at a temperature within the range of approximately 144 to 176 degrees Celsius to form a plurality of microlenses (24a, 24b, 24c, 24d) wherein a spacer layer 22 having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) is formed under the microlens layers before formation of said patterned photoresist layer; and

forming an encapsulant layer on each microlens layers by photochemically cured employing radiation.

Fan teaches that the encapsulant layer can be formed of inorganic or organic encapsulant materials by chemical vapor deposition (CVD) or by a plasma enhanced chemical deposition step. It would have been obvious that the inorganic and organic

encapsulant materials are the insulating materials. Therefore, the encapsulant layer is a transparent insulation layer.

Fan fails to teach that the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, thermoset resin, photosensitive gelatin, and radiation curable resin as recited in present claim 88.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin. See col. 9, lines 15-34. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration. See col. 9, lines 40-41.

Fan fails to teach that the substrate further comprises a CMOS pixel array of a CCD pixel array formed thereon as recited in present claims 89-90.

Fossum teaches a substrate 101 comprises a CMOS pixel array 104 or a CCD pixel arrays formed thereon. See col. 3, lines 3-17 and FIG 1. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Fossum teaching into Fan's method because doing so can speed up the processing speed and save memory space. See col. 4, lines 54-56.

Fan teaches that the passivation layer is formed of a passivation material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride but fails to teach that the insulation layer is a layer of material selected form the group consisting of silicon oxide, silicon nitride, and silicon oxynitride as recited in present claim 94.

However, ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to form the insulation layer using material selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

Fan teaches forming the encapsulant layer comprises a radiation exposure step but fails to teach that treating the lens forming regions to form a plurality of microlenses comprises a radiation exposure step as recited in present claim 93.

However, ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to include a radiation exposure step in forming a plurality of microlenses.

Fan fails to teach wherein said insulation layer forming step comprises a plasma deposition step carried out at a temperature within the range of approximately 200 to 400 degrees Celsius as recited in present claim 96.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the temperature of the plasmas deposition step through routine experimentation and optimization to obtain optimal or desired device performance because the temperature of the plasmas deposition step is result-effective variables and there is no evidence indicating that the temperature of the plasmas deposition step is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

5. Claim 99 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548).

Fan teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and FIGS. 1-2):

forming a patterned photoresist layer on an imaging device;

patterning said patterned photoresist layer to form a plurality of lens forming regions;

treating said lens forming regions by thermally reflowed to form a plurality of microlenses (24a, 24b, 24c, 24d);

depositing an encapsulant layer on the plurality of microlenses;

Fan teaches that the encapsulant layer can be formed of inorganic or organic encapsulant materials. It would have been obvious that the inorganic and organic encapsulant materials are the insulating materials. Therefore, the encapsulant layer is a transparent insulation layer.

Fan fails to teach that the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, and thermoset resin as recited in present claim 99.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin. See col. 9, lines 15-34. ***It would have been obvious to one of ordinary skill in the art of making semiconductor*** to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration. See col. 9, lines 40-41.

Fan fails to teach depositing a transparent insulation layer on the plurality of microlenses at a temperature within the range of approximately 200 to 400 degrees Celsius as recited in present claim 99.

However, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the temperature of the deposition step through routine experimentation and optimization to obtain optimal or desired device performance because the temperature of the deposition step is result-effective variables and there is no evidence indicating that the temperature of the deposition step is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-9179 for regular communications and (703) 746-9179 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.
July 19, 2002

LONG PHAM
PRIMARY EXAMINER